(12) UK Patent Application (19) GB (11) 2 175 486 A

(43) Application published 3 Dec 1986

(21) Application No 8611064

(22) Date of filing 7 May 1986

(30) Priority data

(31) 486/85 (32) 9 May 1985 (33) AU

(51) INT CL[4]
A23K 1/18

(52) Domestic classification (Edition H)
A2B 341 834 KG

(56) Documents cited
GB 1604382 GB 1604381 GB 1135856
US 4251547 US 3889007 US 3591389

(58) Field of search
A2B
Selected US specifications from IPC sub-class A23K

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(54) Food for benthic feeding aquatic animals

(57) A prawn feed presented in a gel matrix which is insoluble in water, the feed comprises a fine mash having a particle size between 100 and 220 microns and contains about 30% to 60% protein, water, and about .75% to about 1.75% of a gelling agent such as sodium alginate, the percentages being by weight based upon the total weight of the feed.

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SPECIFICATION

Food for benthic feeding aquatic animals

The present invention relates to feed stuffs for benthic and demersal aquatic animals including marine and freshwater crustacea and fish.

It has been common to grow these animals using formula feeds manufactured in a way similar to that employed for terrestrial livestock feeds. The pellets are manufactured from a mash compressed at high pressure and raised to high temperatures and this can damage certain nutrients. In addition compression leads to a form of case hardening, appropriate to animals swallowing the pellets whole but highly inefficient and unassimilable in the case of prawns. It is a further disadvantage of this pelletised form of feed that, in water, certain amino acids, vitamins and minerals which are water soluble are lost through leaching thereby wastefully decreasing the food value and cost effectiveness of the pellet. The problem is exacerbated by pellet disintegration in water causing further wasteful losses and seriously increasing the potential pollution effect on the water. Such an increase in pollution can inhibit growth of the aquatic animal and a consequent eutrophication inhibits efficient stock control assessment and forecasts of growth rates and increases the risk of disease.

All these problems are especially applicable to prawns. These animals in cultivation are highly efficient at selecting from the miscellaneous components of the detritus over which they browse particularly as manipulation and mastication of their food takes place outside the buccal cavity being achieved by complex movements of delicate and sensitive mouth parts. These processes are facilitated by the thixotropic character of the present feed material.

Accordingly prawns can be described as extremely fastidious fickle yet sometimes vigourously wasteful feeders with the result that any feed material designed for them must meet very specific requirements in acceptability to the animal and in relation to the costs of manufacture transport and distribution at the feeding sites.

Mash currently employed in the manufacture of feed for prawns often includes particles which are too large for immediate consumption by the animals. When a prawn dislodges particles of feed from the pellet the larger particles are often rejected and swept away by currents. Accordingly there can be considerable wastage through loss of material or rejection of the larger particles in addition to the problem of increasing the surface area of the pellet thus increasing the likelihood of leaching and further disintegration. This is especially true of valuable and sensitive juvenile animals.

It is the object of the present invention to overcome or substantially amellorate these disadvantages.

There is disclosed herein an aquatic animal feed presented in a gel matrix which is insoluble in water; said feed comprising a fine mash having a particle size between about 100 and about 220 microns and containing about 30% to 60% protein; water; and about .75% to about 1.75% of a gelling agent; the percentages being by weight based upon the total weight of the feed.

There is further disclosed herein a method of manufacturing a substantially water insoluble aquatic animal feed, said method including the steps of providing a fine mash having a particle size between about 100 and about 220 microns and containing about 30% to about 60% protein; providing about .75% to about 1.75% of a gelling agent; and mixing the mash and gelling agent with water to provide a gel matrix which is insoluble in water.

Preferably the gel matrix ensures that the resulting mixture is a self supporting paste or dough; the gelling agent is preferably a hydrocolloid, such as sodium alginate.

The preferred form of the present invention is described by reference to the following example.

Firstly a fine dry mash, having a particle size milled to 100 to 220 microns is produced. This is mixed with a sodium alginate (known as Manugel). The resulting material is mixed with approximately 30% fresh water, with a source of calcium ions (calcium sulphate dihydrate) with a sequesterant (Tetrasodium pyrophosphate). This produces a dough with a consistency similar to that of a baker's dough in which the mixing process avoids any shearing effect.

The dough is extruded by means of manually operated or mechanical devices under moderate pressure to a desired configuration, similar in appearance to noodles, and this can be dried or frozen.

The following is a table of a typical mixture to be used in the manufacture of a dough feed prawns.

Product Description	% Prot.	Approximate kg/mt
Wheat Pollard	20	20
Meat Meal	50	110
Fish Meal	65	250
Prawn Head Meal	85	50
Sunflower Meal	38	429
Animal Pancreas Extract	85	140
Salt		1.45
Antibacterial agent		0.125
Antioxidant		0.125
Antimould agent		0.15
Tetrasodium pyrophosphate		11.9
Gypsum		7.0
Sodium alginate		14.0
Vitamin premix)		
)		
Mineral premix) If required		
)		
Fats)		

The vitamin premix, mineral premix and fats listed above may be required if the various products listed above do not provide the dietary requirements of prawns.

The setting time of the gel can be predetermined with minor chemical ajustments according to the availability of calcium ions which are present as calcium sulphate. Tetrasodium pyrophosphate is used as a setting control agent i.e. its presence determines the rate of release of calcium ions. A typical setting time for the material is 15 to 30 minutes.

The alginate c[illegible]e in the proportions of about .75% to about 1.75%, by weight, but more preferably about 1.4%.

Crustacean or mollusc meal and animal pancreas extract meal can be used in part or total replacement of the sources of protein other than fish meal.

A typical prawn feed has the following crude analysis:

Crude Protein	49.85%
Calcium	2.81%
Ash	12.00%
Fats	7.7%
Phosphorous	1.90%
Salt	0.70%

It should be appreciated that the present invention is applicable to other aquatic animals apart from prawns. For example an aquatic animal food could contain 30% to 60% protein if for example it is to be used to feed fish. For prawns, the food should contain 40% to 55% protein but more preferably 45% to 50% protein. The percentages being by weight based upon the total weight of the food.

When the feed material is presented in salt water, the pellet like material remains stable for 3 to 5 days after which it will generally break down. When used in fresh water the gel can automatically rise to the surface after about 4 days subject to water temperature, fermentation and a reduction in specific gravity. On the other hand it is possible to prolong the period of stability in fresh water by further adjustment of the calcium ions.

The formation of the gel is facilitated by the calcium ions present in seawater. When the material is manufactured for freshwater animals further adjustment of the calcium content can ensure efficient gelling nonetheless.

As the gel matrix is insoluble yet soft, it prevents the leaching of essential soluble nutrients including vitamins by enveloping them in a medium which is soft enough to be teased by the prawn at a pace consistent with its ingestion mechanism yet sufficiently rapid to prevent further leaching.

The present invention in its preferred form has considerable advantage over previous pelletised feed in that the leaching of essential soluble nutrients (especially amino acids) is greatly reduced while the problem of pollution is considerably reduced and the particle size becomes far more acceptable to prawns and this minimises wastage.

It should be appreciated that the mash employed can be further tailored, to the needs of particular animals to be fed by species and age, also facilitating the opportunist use of local raw materials.

CLAIMS

1. An aquatic animal feed presented in a gel matrix which is insoluble in water; said feed comprising a fine mash having a particle size between about 100 and about 220 microns and containing about 30% to 60% protein; water; and about .75% to about 1.75% of a gelling agent; the percentages being by weight based upon the total weight of the feed.

2. The animal feed of claim 1 wherein the gelling agent is a hydrocolloid.

3. The animal feed of claim 2 wherein the gelling agent is sodium alginate.

4. T[illegible]imal feed of claim 1 wherein said feed has the consistency of a self supporting paste or dough.

5. The animal feed of claim 4 wherein the feed has the consistency of baker's dough.

6. The aquatic animal feed of claim 1 wherein the mash contains 45% to 55% protein.

7. The aquatic animal feed of claim 6 wherein said mash contains 45% to 50% protein.

8. The aquatic animal feed of claim 4 wherein the gelling agent is in the proportion of approximately 1.4%.

9. A method of manufacturing a substantially water insoluble aquatic animal feed, said method including the steps of providing a fine mash having a particle size between about 100 and about 220 microns and containing about 30% to about 60% protein; providing about .75% to about 1.75% of a gelling agent; and mixing the mash and gelling agent with water to provide a gel matrix which is insoluble in water.

10. The method of claim 9 wherein the feed is mixed so that the matrix ensures that the resulting mixture is a self supporting paste or dough; and the gelling agent is a hydrocolloid, such as sodium alginate.

11. The method of claim 10 wherein the mash, alginate and water are mixed so as to provide the feed with a consistency of baker's dough.

12. The method of claim 9 wherein the mash contains 45% to 50% protein and the gelling agent is in the proportion of approximately 1.4%.

13. The method of claim 9 wherein the gelling agent is sodium alginate.

14. A prawn food substantially as hereinbefore described with reference to the examples.

15. A method of manufacturing a prawn food substantially as hereinbefore described with reference to the examples.

Printed in the United Kingdom for Her Majesty's Stationery Office, 8818935, 12/86 18996. Published at the Patent Office, 25 Southampton Buildings, London WC2A 1AY, from which copies may be obtained.